

# Special themed issue: Education in clinical chemistry and laboratory medicine in various European countries

## Laboratory medicine education in Lithuania

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### Abstract

In Lithuania there are two types of specialists working in medical laboratories and having a university degree: laboratory medicine physicians and medical biologists. Both types of specialists are officially being recognized and regulated by the Ministry of Health of Lithuania.

Laboratory medicine physicians become specialists in laboratory medicine after an accredited 4-year multidisciplinary residency study program in Laboratory Medicine. The residency program curriculum for laboratory medicine physicians is presented. On December 9, 2009 the Equivalence of Standards for medical specialists was accepted and Lithuanian medical specialists in Clinical Chemistry and Laboratory Medicine can now apply for EC4 registration.

Medical biologists become specialists in laboratory medicine after an accredited 2-year master degree multidisciplinary study program in Medical Biology, consisting of 80 credits.

Various postgraduate advanced training courses for the continuous education of specialists in laboratory medicine were first introduced in 1966. Today it covers 1-2-week courses in different subspecialties of laboratory medicine. They are obligatory for laboratory medicine physicians for the renewal of their license. It is not compulsory for medical biologists to participate in these courses.

The Centre of Laboratory Diagnostics represents a place for the synthesis and application of the basic sciences, the performance of research in various fields of laboratory medicine, as well as performance of thousands of procedures daily and provision of specific teaching programs.

**Key words:** laboratory medicine; medical biology; education of specialists

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## Laboratory medicine – evolution of specialty

One of the most important factors in the progress of medicine is the development of laboratory medicine, which unites different branches of biomedical sciences.

Laboratory medicine has its origins in ancient medicine, but developed only as science advanced. The first medical diagnoses made by humans were based on what ancient physicians could observe with their eyes and ears, which sometimes also included the examination of human specimens (1).

The development of scientifically based clinical laboratory services in the late 19th and early 20th centuries as well as the latest modern scientific biomedical research led to the development of effective diagnosis and treatment of patients. Advances in scientific knowledge influenced both medical practice and medical education, namely the education of specialists in laboratory medicine. So laboratory diagnostics is a biomedical profession based on advanced analytical technologies, diagnostic expertise and medical knowledge.

## Recognition of the laboratory medicine specialists

Laboratory medicine is both a clinical discipline and a separate branch of medical science. A medical laboratory or clinical laboratory is a laboratory where tests are done on clinical specimens in order to get information about the health of a patient for the diagnosis, treatment and prevention of disease. Clinical diagnostic services are supervised by a specifically trained staff having a university degree: laboratory medicine physicians or medical biologists.

In Lithuania there are two types of specialists working in medical laboratories and having a university degree: laboratory medicine physicians and medical biologists. Both types of specialists are officially recognized and regulated by the Ministry of Health of Lithuania: laboratory medicine physicians fully and the regulations are set in the Law on Medical practice; medical biologists - not directly: the regulations are directly set in the Medicine Norm and not directly (generally) in the general law and regulations of health professionals.

Laboratory medicine physicians become specialists in laboratory medicine after an accredited 4-year residency study program in Laboratory Medicine. The register of laboratory medicine physicians and their licensing is implemented by the Ministry of Health of Lithuania.

Medical biologists become specialists in laboratory medicine after an accredited 2-year master degree study program in Medical Biology. They are not yet registered and licensed specialists. There is a plan to start this process in 2011/2012 with the cooperation of the Ministry of Health and the Lithuanian Society of Laboratory Medicine.

The Ministry of Health of Lithuania has approved the norm of a specialist:

- Norm of Medical Biologist: rights, duties, competency and responsibility.
- Norm of Laboratory Medicine Physician: rights, duties, competency and responsibility.

These norms have some differences and similarities for laboratory medicine physicians and medical biologists. The differences are in the backgrou-

nd education and activities based on the professional title (for example, diagnosis, prescription of medicine, treatment, consulting work), while the similarities are in laboratory procedures, analysis, interpretation.

## General principles of education in laboratory medicine in Lithuania

The Faculty of Medicine of Vilnius University is one of the oldest medical schools in Lithuania. In 1781 the *Collegium Medicum* was founded and the Faculty of Medicine grew out of it. Today the Faculty of Medicine is one of the biggest and most important at Vilnius University. There are 5 departments, 2 institutes and 16 clinics. About 350 personnel work there: professors and habilitated doctors, associate professors and doctors of sciences, assistant professors and science assistants. At the Faculty of Medicine for today specialists in different study programs are being educated. There are about 1730 students at the faculty. More than 700 residents are in postgraduate studies; specialists in all medical specialties take various advanced training courses as their continuing medical education. The Department of Physiology, Biochemistry and Laboratory Medicine of the Faculty of Medicine of Vilnius University was provided for the realization of the syllabus for the education of laboratory medical science as a study subject at different levels (Figure 1):

### Integrated studies:

- **Medicine:** the overall study process lasts for 6 years and laboratory medicine as a subject is studied in the 5<sup>th</sup> year; it consists of 74 hours of lectures, seminars and practical training.
- **Odonthology:** the studies are covered in 5 years; The Laboratory Medicine study program is in the 5<sup>th</sup> year and consists of 16 hours of lectures and seminars.

### Bachelor studies:

- **Public health:** studies last for 4 years and the subject of laboratory medicine is in the 4<sup>th</sup> year (40 hours of lectures, seminars and practical training).

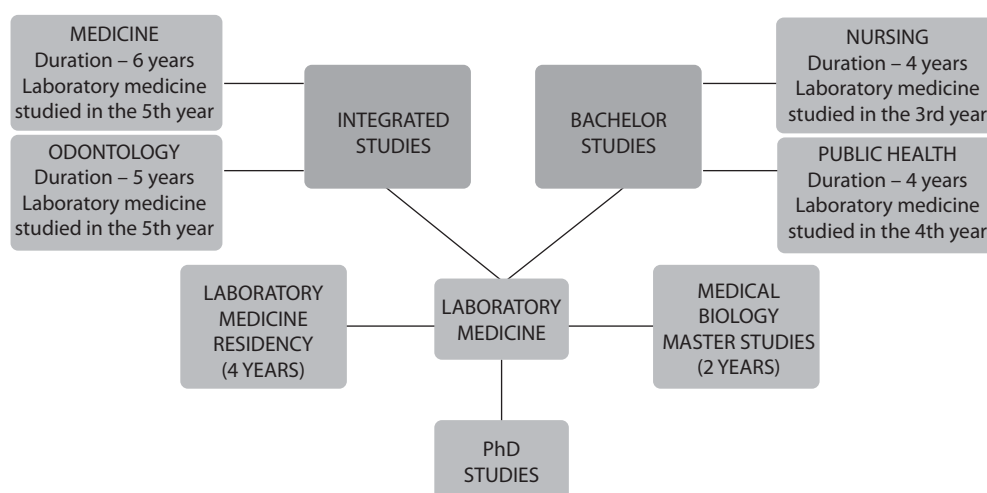


FIGURE 1. Laboratory medicine education in Vilnius University

- **Nursing:** studies for a bachelor's degree in Nursing last for 4 years and the Laboratory Medicine study program is studied in the 3<sup>rd</sup> year (48 hours of lectures, seminars and practical training).

#### Residency studies:

- **Laboratory Medicine** – 4 years

#### Master degree studies:

- **Medical biology** – 2 years

Exceptionally well qualified individuals with a master's degree are attracted for PhD and postdoctoral studies. In 1991 PhD (doctoral) research studies (4 years) in Clinical Chemistry and other programs were introduced at Vilnius University.

### Laboratory medicine physician education process

Only physicians (medical doctor, medical practitioner) with a university degree in Medicine (6 years of studies) have the possibility to enter the training in Laboratory Medicine. Laboratory medicine physician as a medical specialty residency was first implemented in 1992 as 2 years of specialized training. In 2003 the program was harmonized according to Council Directive 93/16/EEC of April 5, 1993 in order to facilitate the free movement of doctors

and the mutual recognition of their diplomas, certificates and other evidence of formal qualifications as a 4-year-long training course. This is a multidisciplinary training residency program. The syllabus for post-graduate training (residency) in laboratory medicine is similar to the syllabus prepared by the EC4 Committee (2,3).

For physicians who are in the 4-year Laboratory Medicine residency, training is given on a full-time basis in approved laboratories and at other specific establishments that are recognized by the university and the Ministry of Health. It entails participation in the full range of medical activities of the department where the training is given. These posts are remunerated by the Ministry of Health. The training ends in a state exam and gives the professional qualification of "Laboratorijos gydytojas" (laboratory physician), with the issue of "Rezidentūros pažymėjimas" (residency certificate). The main subspecialties of Laboratory Medicine that are studied during the residency include biochemistry (clinical chemistry), laboratory hematology, clinical microbiology, clinical immunology, cellular pathology, transfusion medicine, molecular biology and medical genetics. After ending the residency studies laboratory medicine physicians are registered and provided with a License by the Ministry of Health of Lithuania.

## Curriculum for laboratory medicine physician residency program

The first study year includes:

- Introduction to laboratory medicine;
- Introduction to biotechnology;
- Mathematical statistics and informatics in biomedicine;
- Clinical chemistry.

The second year of study includes:

- Laboratory hematology;
- Urinalysis and body fluid cytology;
- Cytopathology;
- Laboratory diagnostics of inherited diseases.

The third year of study includes:

- Clinical immunology;
- Clinical microbiology and virology;
- Human parasitic diseases and their laboratory diagnostics;
- Laboratory diagnostics of sexually transmitted diseases.

The fourth year of study includes:

- Laboratory diagnostics in transfusion medical service;
- Rotation of residents in other clinics (endocrinology, clinical cardiology and intensive care cardiology, dermatovenerology, gastroenterology, clinical hematology, rheumatology, nephrology).
- Selected optional courses: methods of biochemical investigations, analytical cytology, auto-antibodies: clinical significance and diagnostics, pathogenesis of atherosclerosis and laboratory diagnostics of cardiovascular diseases, laboratory test quality and management of laboratories, cancer biology.
- Specialization in the chosen laboratory (work place).

Since 1992, 3-5 physicians are admitted to Laboratory Medicine residency training at Vilnius University per year. The number of residents is coordinated by the Ministry of Health.

On December 9, 2009 the Equivalence of Standards for medical specialists (laboratory medicine physicians) was accepted. This means that Lithuanian medical specialists in Clinical Chemistry and

Laboratory Medicine who meet these standards can now apply for EC4 registration (4).

## Medical biologist education process

In 2000 a master's degree study program entitled Medical Biology was implemented at the Faculty of Medicine of Vilnius University. The main purpose of studies in medical biology is to provide specialists with theoretical and practical knowledge, giving them the skills to work in laboratories of biomedical research and the health care system. Upon completing the training program and exams, graduates are granted a master's degree in Medical Biology.

Requirements for entry include a university bachelor's degree in Natural Sciences (biochemistry, molecular and ecological biology, public health and nursing). Mandatory courses required to enter master's degree studies in Medical Biology include human anatomy, human physiology, general and analytical chemistry, bio-organic chemistry, biochemistry, microbiology, general biology, cytology and/or histology and genetics. Educational requirements for the two-year master's degree program in Medical Biology consist of 80 credits. This is multidisciplinary training, as in the case of laboratory medicine physicians (including clinical chemistry, laboratory hematology, clinical immunology, clinical microbiology, molecular biology, medical genetics, blood banking, etc.).

The 1st year of master's degree studies consists of the following study programs:

- Pathological physiology;
- Pathological anatomy;
- Biochemistry of hormones and vitamins;
- Molecular biology, human biology and genetics;
- Human molecular genetics and inherited metabolic disorders;
- Biotechnology and informatics in biomedicine;
- Medical microbiology and laboratory diagnostics of infectious diseases;
- Basics of immunology and cancer biology;
- Research work.

During the second year students study and do research in:

- Clinical biochemistry;
- Laboratory hematology;
- Biochemistry and cytology of body tissues and fluids;
- Clinical immunology and immunohematology;
- Research work;
- Laboratory practice;
- Work on master's degree thesis.

Graduation of the program is organized by defense of experimental thesis and/or exam on a biomedical subject. At Vilnius University the educational program trains approximately 7-9 specialists per year.

The program was accredited in 2005 and revised in 2010.

There is an on-going work with the Ministry of Health for the organization of post-graduate specialty training for medical biologists. After that medical biologists will meet the Equivalence of Standards for specialists-medical biologists-in laboratory medicine.

## Continuous education in laboratory medicine

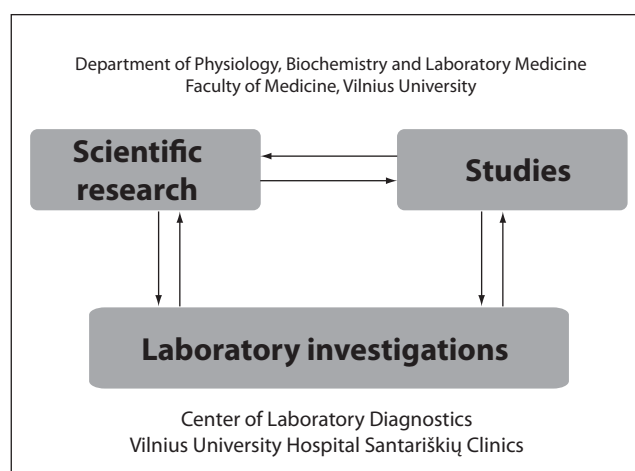
Various post graduate advanced training courses for continuous education of specialists in laboratory medicine were first introduced in 1966. Today it covers 1-2 week courses in different subspecialties of laboratory medicine. They are obligatory for laboratory medicine physicians. Though the license of a specialist has no term, every 5 years physicians have to present a report about the length of service and information about participation in postgraduate advanced training courses (in total 120 hours), the program of which is coordinated with the Ministry of Health.

Since medical biologists are not yet registered and licensed specialists, participation in these courses is not compulsory. These specialists actively participate in continuous education courses however, in order to develop further specialization and professional perfection.

## Organization of the educational process

The Department of Physiology, Biochemistry and Laboratory Medicine of the Faculty of Medicine of Vilnius University was provided for the realization of the syllabus for the education and training of residents in Laboratory Medicine and medical biologists and for the performance of research. The clinical part of the department is located in the Center of Laboratory Diagnostics of Vilnius University Hospital, one of the largest medical centers in Lithuania. The Center of Laboratory diagnostics represents a place for the synthesis and application of the basic sciences, the performance of research in various fields of laboratory medicine, the treatment of patients by engaging in clinical and basic research, and the performance of thousands of procedures daily and provision of specific teaching programs (Figure 2) (5). The laboratories of the Center of Laboratory Diagnostics of Vilnius University Hospital - with 14 laboratory medicine physicians, 28 medical biologists, 63 laboratory technicians and about 20 other personnel - have evolved into a fully automated service using the latest technology to perform thousands of procedures each year for Vilnius University Hospital, hospitals and health centers affiliated with this medical center, other hospitals, out-patient clinics and other institutions.

The university trained professionals who graduated from the university study program in Biology



**FIGURE 2.** Laboratory medicine at Vilnius University and Vilnius University Hospital Santariškių Clinics.



before the master's degree studies in Medical Biology were introduced (Soviet era model) work in medical laboratories. These specialists had to pass a program of special courses (4-5 months) and have a certain number of years of practical work in medical laboratories.

The Lithuanian Society of Laboratory Medicine is an organization uniting about 260 specialists working in the field of laboratory medicine (laboratory medicine physicians and medical biologists). Today the percentage of specialists is about 20% laboratory medicine physicians and 80% medical biologists. Up to 12 specialists have a PhD degree, and one has the degree of a habilitated doctor. Since 1999 the Lithuanian Society of Laboratory

Medicine and the Lithuanian Society of Human Genetics have been publishing a journal entitled *Laboratory Medicine* ([www.laboratorine-medicina.lt](http://www.laboratorine-medicina.lt)) which is published in Lithuanian and in English (the journal is included on the register of Scientific Journals Ranking System Index Copernicus).

## Conclusion

Creating and implementing a structure of education and studies and a system of training in laboratory medicine was the basis for improving the degree of the professional qualification of specialists working in clinical (medical) laboratories in Lithuania.

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## Edukacija iz laboratorijske medicine u Litvi

### Sažetak

U Litvi postoje dvije vrste specijalista zaposlenih u medicinskim laboratorijima sa sveučilišnim diplomama: liječnik laboratorijske medicine i medicinski biolog. Obje su vrste specijalista službeno priznate te im je status zakonski reguliran od strane Ministarstva zdravstva Republike Litve.

Liječnici laboratorijske medicine postaju specijalisti laboratorijske medicine nakon uspješnog završetka specijalističkog staža prema četverogodišnjem akreditiranom multidisciplinarnom studijskom programu laboratorijske medicine. Predstavljen je plan i program specijalističkog staža za liječnike laboratorijske medicine. 9. prosinca 2009. prihvaćen je Ekvivalent standarda za medicinske specijaliste (engl. *Equivalence of Standards for medical specialists*) te se sada litavski specijalisti kliničke kemije i laboratorijske medicine mogu prijaviti u EC4 registar.

Medicinski biolozi mogu postati specijalisti nakon završenog akreditiranog dvogodišnjeg programa multidisciplinarnog diplomskog studija medicinske biologije koji nosi 80 ECTS bodova.

Razni poslijediplomski napredni tečajevi trajnog usavršavanja specijalista laboratorijske medicine uvedeni su već 1966. Danas postoje jedno- do dvotjedni tečajevi različitih subspecijalizacija laboratorijske medicine. Oni su obavezni za liječnike laboratorijske medicine kako bi mogli obnoviti svoju dozvolu za rad (licencu). Ti tečajevi nisu obavezni za medicinske biologe.

Centar za laboratorijsku dijagnostiku Kliničke bolnice Santariškių Clinics u Vilniusu mjesto je gdje se temeljne znanosti sintetiziraju i primjenjuju, tu se rade istraživanja na raznim poljima laboratorijske medicine i nude specifični programi školovanja.

**Glavne riječi:** laboratorijska medicina; medicinska biologija; školovanje specijalista